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J. Stantini J. Stantini

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Customer No.: 07278 Docket No: 01313/100F022-US1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Harding et al.

Serial No.: 09/557,804 Art Unit: 1623

Confirmation No.: 8941

Filed: April 25, 2000 Examiner: E. White

For: CELLULOSE ETHERS AND METHOD OF PREPARING THE SAME

REPLY BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Reply Brief is responsive to the Examiner's Answer dated March 24, 2004 and is submitted in triplicate. A Request for Oral Hearing is submitted concurrently herewith.

No fee is believed due with this Reply Brief. If, however, any fee is due, the Commissioner is authorized to charge it to Deposit Account No. 04-0100.

In the Examiner's Answer, the Examiner has misconstrued the pending product-by-process claims and not properly considered the evidence of non-obviousness provided by appellants.

The Process Limitations of a Product-By-Process Claim Provide a Fingerprint of the Product

In his Answer, the Examiner contends:

> Appellant argues against the rejection on the ground that the instantly claimed carboxymethyl cellulose (CMC) is somehow different because of the process used to produce the product. This argument is not persuasive since process limitations cannot impart patentability to a product that is not patentably distinguished over the prior art.

Process limitations, however, are pertinent to the patentability of a product to the extent the process imparts features that render the product novel and non-obvious.

> A product-by-process claim merely uses one statutory class of invention (i.e., process limitations) to define or fingerprint another statutory class (i.e., the product) which is not readily susceptible to definition solely by structure or physical characteristics. As the court indicated in *In re Thorpe*, 777 F.2d 695, 227 USPQ 964 (Fed. Cir. 1985) citing *In re Brown*, 459 F.2d 531, 173 USPQ 685, 688 (CCPA 1972) and *In re Pilkington*, 411 F.2d 1345, 162 USPQ 145 (CCPA 1969):
>
>> Product-by-process claims are not specifically discussed in the patent statute. The practice and governing law have developed in response to the need to enable an applicant to claim an otherwise patentable product that resists definition by other than the process by which it is made. For this reason, even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. (citations omitted)

Ex parte Lyell, 17 USPQ2d 1548, 1552 (BPAI 1990).

For example, in *In re Pilkington*, 411 F.2d 1345, 1348-1349 (CCPA 1969), the predecessor to the Court of Appeals for the Federal Circuit found a claim directed to a glass sheet made by a particular process patentable because the glass sheet had better surface perfection and freedom from internal stress than the glass sheets of the cited prior art. The claim at issue in *Pilkington* did not recite any structural features of the glass sheet. It was the product *of the process* recited in the claim, not the product made by any process, which was compared to the prior art. *See In re Thorpe,* 777 F.2d at 697 ("Thorpe does not assert that the *product of his process* is different from the product of the prior art." (italics added)). If the process recitations in a product-by-process claim have no weight, a patent applicant could not obtain a patent on a new form of an old product that could only be characterized by the process for making it. This is an absurd result, and is not the law.

Like in *Pilkington*, appellants have discovered a new form of a known product, i.e., a new form of carboxymethyl cellulose (CMC). Also, as in *Pilkington*, appellants have claimed the new form of CMC in terms of its process to provide a fingerprint of the product.

Therefore, the process recited in the pending claims must be considered to the extent it provides novel and non-obvious features to the product. These features include the increased viscosity of the CMC product, compared to similar CMC's of the prior art.

The Process Recited in the Pending Claims is Different Than That in Mansikkamaki[1]

The Examiner argues that the process and starting material for making CMC set forth in Mansikkamaki is within the scope of the process recited in the pending claims (see, for example, the sentence spanning pages 4 and 5 of the Examiner's Answer). This is not the case.

The presently claimed process requires converting mercerized and recovered (i.e., pre-mercerized) cellulose pulp into CMC. The pre-mercerized cellulose pulp, also known as cellulose II, has a different crystal structure than native cellulose pulp, which is known as cellulose I. *See* Sarko et al., "Crystalline Alkali-Cellulose Complexes as Intermediates During Mercerization", pages 169-177 written as Chapter 9 of The Structures of Cellulose, Rajai H. Atalla, Editor, ACS Symposium Series Volume 340, American Chemical Society, Washington, DC, 1987 (Exhibit 2 to the January 15, 2003 Appeal Brief). Cellulose II is prepared by mercerization (i.e., treating cellulose pulp with alkali to form alkali cellulose) and recovering it. It is the recovery of the cellulose pulp which produces the final irreversible transformation to cellulose II.

Conversion or derivatization of cellulose pulp to CMC is a well known process. The first step of the process is the formation of an alkali cellulose. This is followed by etherification of the alkali cellulose. The etherification is performed in the presence of the alkali. In other words, the cellulose pulp is not recovered after the alkali is added and before the etherification is performed. Therefore, the conversion process does not involve mercerizing and recovering the cellulose pulp as recited in step (a) of the claimed process. This conversion process is the same as that described in Mansikkamaki.

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[1] In the Examiner's Answer, EP 879827 is referred to as "Mansikkamki" rather than "EP '827" as in the
(continued...)

The process in Mansikkamaki does not, however, use pre-mercerized cellulose pulp. The cellulose pulp in Mansikkamaki is only mercerized once - not twice as in the process of the present invention. See the diagrams below comparing the process of the present invention to that of Mansikkamaki.

Process of the Present Invention	Prior Art Process (Mansikkamaki)
Mercerization (step (a))	
↓	
Recovery (step (a)) (Cellulose II formed)	
↓	
Conversion of Cellulose II to CMC by: Mercerization (step (b))	Conversion of Cellulose II to CMC by: Mercerization
↓	↓
Etherification (step (b))	Etherification
↓	↓
CMC	CMC

Therefore, the cellulose pulp which is mercerized, etherified, and neutralized in Mansikkamaki is native cellulose (**cellulose I**), whereas that in the presently claimed process is cellulose II.

The Examiner further argues that Mansikkamaki discloses CMC "derived from sulphite softwood pulp ... which is analogous to the softwood kraft cellulose pulp used in the preparation of instant claims 39 and 60-64." "Kraft" pulp, however, is different than "sulphite"

(...continued)
Appeal Brief filed January 15, 2003. For simplicity, appellants refer to this document as "Mansikkamki".

pulp. As shown by Exhibit 1 attached hereto, the terms "kraft" and "sulphite" refer to different pulp processes.

To clarify the record, the CMC recited in the pending claims can be produced from *any* cellulose pulp, not just softwood kraft cellulose pulp. The pending claims only require that, when the cellulose pulp is southern softwood kraft, the mercerized and recovered cellulose pulp in step (a) has a viscosity greater than 12 cP.

The CMC of the Present Invention is Different Than the CMC of Mansikkamaki

According to the Examiner, appellants are arguing that the presently claimed CMC is different than that of Mansikkamaki because a cellulose pulp of a different viscosity is used to prepare the CMC:

> [A]rguments presented by Appellant regarding the pulp of the instant invention being of a different type and having a different viscosity is not persuasive since products of identical chemical composition cannot have mutually exclusive properties.

(page 5 of the Examiner's Answer).

This is not appellants' position. It is the viscosity of the presently claimed CMC, not that of the cellulose pulp used to make it, that is significantly greater than the viscosity of the CMC of the prior art. The viscosity data provided in the application and in appellants' Appeal Brief is of the presently claimed CMC product, not the starting cellulose pulp. See Tables 1-4 on pages 9 and 10 of the Appeal Brief. The data clearly shows that the CMC's of the present invention have significantly higher viscosities than those made from cellulose I, such as in Mansikkamaki (labeled as "control" in the tables). This is evidence of the novelty and

nonobviousness of the presently claimed CMC. The Examiner has failed to consider this evidence in his Answer.

While two products may share similar properties and structure, they are not necessarily identical. For instance, the glass sheet claimed in *Pilkington* was held to be new and non-obvious over glass sheets described in the prior art. *Pilkington, supra*. Similarly, the CMC of the present invention is new and non-obvious over the CMC of the prior art as shown by its increased viscosity.

The Examiner directs the Board's attention to the 2% CMC viscosities recited in Table 2 on page 3 of Mansikkamaki. These viscosities were determined from a 2% solution of CMC. In contrast, the viscosities recited in the tables of the Appeal Brief and the instant application are 0.5 and 1% CMC solution viscosities. Because the test solutions in the instant application and Mansikkamaki have different concentrations of CMC, they cannot and should not be compared. Furthermore, Mansikkamaki does not indicate the type of cellulose pulp from which the CMC disclosed therein is derived. As shown by the data in the application, the type of cellulose pulp selected as a starting material has a profound effect on the viscosity of the CMC formed. Therefore, the reference is fatally flawed with regard to its CMC viscosity teachings.

The instant application provides numerous comparative examples of CMC's produced by the process of the present invention and that of the prior art, such as Mansikkamaki. For example, the results of CMC produced from southern softwood kraft pulp by the prior art method (control) and the method of the present invention are shown in Table 2 on page 19 of the application. *See also* Table 2 on page 9 of the Appeal Brief. The 1% viscosity of the prior art CMC was 586 cP. Similar CMC's produced with pulp that was pre-mercerized with 14 or 18%

sodium hydroxide had a 1% viscosity of 1268 and 1467 cP, respectively. This is more than a 100% increase in viscosity. CMC derived from northern softwood sulfite pulp exhibited a similar increase in viscosity. The CMC prepared by the prior art method exhibited a 1% viscosity of 898 or 1087 cP (depending on whether the pulp was directly ground or disintegrated, re-formed into sheets and ground). The CMC produced with pulp that was pre-mercerized with 14 or 18% sodium hydroxide had a 1% viscosity of 1835 and 2608 cP, respectively.

A CMC having a different viscosity than a prior art CMC is necessarily different. Appellants respectfully submit that the data in the present application establishes beyond a preponderance that the presently claimed CMC is novel and non-obvious over that in Mansikkamaki. *In re Oetiker*, 977 F.2d 1443, (Fed. Cir. 1992).

Finally, appellant's disagree with the Examiner's mischaracterization of Appellants' Summary of the Invention in the Appeal Brief. Appellants summarized the present invention as a carboxymethyl cellulose (CMC) made by the process recited in the pending claims, and stated that the CMC has significantly higher viscosities than similar CMC's produced by prior art methods. The Examiner argues that the reference to the significantly higher viscosities of the CMC is part of the argument. The higher viscosities are an inherent property of the CMC of the present invention, and therefore are properly referred to in the Summary of the Invention.

For the foregoing reasons, Mansikkamaki fails to anticipate or render obvious the presently claimed invention and the rejection of claims 39 and 60-63 should be reversed by the Board. Such a disposition is earnestly solicited.

Respectfully submitted

Jay P. Lessler
Reg. No. 41,151
Attorney for Applicants

DARBY & DARBY
Post Office Box 5257
New York, NY 10150-5257
Phone (212) 527-7700

HANDBOOK OF PULP & PAPER TERMINOLOGY

A Guide To Industrial and Technological Usage

by Gary A. Smook

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KRAFT PROCESS: Alkaline chemical pulping process using sodium hydroxide (NaOH) and sodium sulfide (Na_2S) as the active cooking chemicals. The process is noted for producing the strongest pulps. The word kraft means strength in both German and Swedish. Syn. Sulfate Process.

KRAFT PULP: Pulp manufactured by the kraft process. Syn. Sulfate Pulp.

L

LEACH CASTER: Wooden tank with a perforated bottom into which is dumped the high-yield cook from a spherical digester. Excess liquor is drained away and the cooked chips are then plowed by means of revolving sweep arms toward an opening, from which the chips are conveyed to refiners for defiberization.

LEVEL TANK: Surge tank within the Kamyr continuous digester system between the chip chute circulation and the makeup liquor pump.

LIGNOSULFONATES: Compounds formed during sulfite cooking by the reaction of sulfurous acid or bisulfite ion with the lignin in the wood. These compounds are soluble in the cooking liquor.

LIGNOSULFONIC ACID: Organic sulfonic acid formed during sulfite pulping by reaction between lignin and sulfite or bisulfite ions.

LIMING UP: Precipitation and deposition of calcium compounds in a digester due to carrying out calcium acid sulfite cooks at too high pH.

LIQUOR: Term used to designate the liquid phase when other phases are present.

LIQUOR CHARGE: Weight (or volume) of white liquor and/or black liquor added to a batch digester for a cook. See also FREE LIQUOR.

LIQUOR CIRCULATION: Movement of cooking liquor through the chip mass during a cook, either by convection or pumping. When a pump is employed, the liquor is usually extracted through strainer plates, pumped through a heat exchanger and returned to different points in the digester.

LIQUOR FILLING: Operation in which white and black liquors are added to a batch digester, usually from measuring tanks.

LIQUOR PENETRATION: See IMPREGNATION.

LIQUOR-TO-WOOD RATIO: Ratio of the weight of cooking liquor charged (including moisture in the wood) to the weight of oven dry chips charged, an important control parameter in any chemical cooking process. Syn. Liquid-To-Wood Ratio.

LIQUOR TRAP: Type of entrainment separator, usually of cyclonic design, which removes liquid droplets and/or solid particles from a gas stream, e.g., from digester relief gases.

LOW-LIGNIN PULPING: Proposed modification of kraft pulping to produce softwood pulp of 20 kappa number by supplementing kraft liquor with anthraquinone and increasing effective alkali charge and sulfidity.

LOW-PRESSURE FEEDER: Tapered star feeder with six pockets that feeds chips from atmospheric pressure to approximately 20 psig as they enter the steaming vessel of a Kamyr digester system.

M

MAGNEFITE PROCESS: Proprietary magnesium bisulfite pulping and recovery process.

MAGNESIA: Magnesium oxide.

MAGNESIUM BASE LIQUOR: Bisulfite cooking liquor containing magnesium bisulfite [$Mg(SO_3)_2$] as the principal active cooking chemical.

MAGNESIUM OXIDE: (MgO) Entrained inorganic residue formed during the combustion of magnesium bisulfite waste liquor which is recovered and reacted with sulfur dioxide to reconstitute the magnesium base cooking liquor. Syn. Magnesia.

MAKEUP CHEMICAL: Chemical which is added to a chemical pulping system in order to replace losses, e.g., saltcake in the kraft system, to compensate for soda and sulfur losses.

MASONITE PULPING PROCESS: Pulping process to convert wood chips into a fibrous raw material for fiberboard. The chips are first softened by relatively low-pressure steam (350 psig, 430°F) and then elevated to high pressure (about 1000 psig, 540°F) before being discharged through a slot (down to atmospheric pressure) where the chips are exploded and shredded into a mass of fiber bundles.

M & D DIGESTER: Continuous digester designed by Messing and Durkee and manufactured by C.E. Bauer. It consists essentially of an inclined tube with a length-wise midfeather around which conveyor flights are carried. Retention time of the pulping raw material can be precisely controlled by the speed of the conveyor.

nmercial application is
nd some nonwood cellu-

IR: Bisulfite cooking liq-
sulfite ($NaHSO_3$) as the
emical.

E: See SODA ASH.

LFIDE: See HYDRO-

: (NaOH) Active chem-
aline pulping processes.

O) Anhydrous sodium
lium is typically used as
quivalent weights of all
ed in the kraft mill.

e SALTCAKE.

a_2S) Active chemical in
Sodium sulfide in solu-
ium hydrosulfide and

erm for a cook that has

which is soluble over the
ed in sulfite pulping. Of
um and ammonium are
ntermediate and calcium
low pH.

Chemical pulping proc-
or other cellulosic raw
n an organic solvent at
ure to liberate cellulosic
us methods have been
hanol, methanol (with
, phenol, acetic acid, for-
ycerol, glycol, dioxane,
SO). No solvent pulping
sed on a full commercial
en demonstrated at the

: Proposed scheme to
kraft pulps by reducing
ok in order to redeposit

JOR: Liquor separated
emical cook, containing
icals and the dissolved
Syn. Residual Pulping
uor.

SPENT SULFITE LIQUOR: Liquor separated from the pulp following a sulfite cook, containing the residual cooking chemicals and the dissolved constituents of the wood. Syn. Red Liquor.

SPHERICAL DIGESTER: Rotary digester of spherical construction. Syn. Globe Digester.

SPRAY COOLING: Method of cooling and absorbing SO_2 gas during preparation of cooking acid in which water in finely divided form is contacted with the sulfur burner gas in two stages. In the first stage, the hot gas is saturated with water vapor to drop the temperature; in the second stage, water vapor is condensed and SO_2 gas is absorbed.

STEAMING: Treatment of chips with steam in a separate vessel before they enter a continuous digester. The objective is to pre-heat the chips and remove air from the chip mass. See also PRE-STEAMING.

STEAMING VESSEL: Vessel in a continuous cooking system through which chips are conveyed and exposed to a displacement flow of steam which heats the chips and flushes out air and other non-condensibles.

STEAM-PHASE DIGESTER: Cooking vessel in which impregnated chips are heated with direct steam to bring them up to the cooking temperature.

STORAGE ACID: Raw acid held in reserve for later transfer to the sulfite mill accumulators.

STRAINER: Perforated ring on the inside surface near the midpoint of a batch digester through which liquor is extracted and circulated during a cook.

SULFATE PROCESS: See KRAFT PROCESS.

SULFATE PULP: See KRAFT PULP.

SULFIDATION: Chemical substitution of sulfide ions for hydrogen atoms. Sulfidation of lignin is a minor reaction during alkaline pulping processes.

SULFIDE: See SODIUM SULFIDE.

SULFIDITY: With respect to white liquor or green liqour, the ratio of sodium sulfide (Na_2S) concentration to either active alkali concentration or to total titratable alkali concentration, all in terms of equivalent sodium oxide (Na_2O), usually expressed as a percentage. The basis of white liquor sulfidity must be specified.

SULFITATION: Reaction of SO_2 gas with a base chemical to produce sulfite or bisulfite cooking liquor.

SULFITE PROCESS: Generic term for any chemical pulping process employing sulfurous acid and/or bisulfite or sulfite ions as the primary or secondary delignification chemicals. Generally a qualifying term is prefixed. See also ACID SULFITE PROCESS, BISULFITE PROCESS, NSSC PROCESS, ALKALINE SULFITE PROCESS, MULTI-STAGE SULFITE PROCESS.

SULFITE PULP: Pulp manufactured by any sulfite process.

SULFONATION: Chemical substitution of SO_3H groups for hydrogen atoms. The sulfonation of lignin is a major mechanism for lignin dissolution during sulfite pulping.

SULFUR: (S) Yellow nonmetallic element, used as raw material for makeup of sulfur dioxide. It is also used as a makeup chemical in the kraft recovery cycle and for polysulfide formation.

SULFUR BURNER: Furnace used for the controlled burning (oxidation) of elemental sulfur into sulfur dioxide.

SULFUR DIOXIDE: (SO_2) Toxic gas formed readily by burning sulfur in air or by roasting pyrite. Aqueous sulfur dioxide (solution of sulfur dioxide in water) and the metallic salts are used extensively in acidic and high-yield pulping processes. Aqueous sulfur dioxide is also used in pulp bleaching.

SULFUROUS ACID: Solution of sulfur dioxide (SO_2) in water. Since the actual compound, "sulfurous acid" (H_2SO_3), has been shown not to exist, the term "aqueous SO_2," has been suggested as a better descriptive term.

SULFUR TRIOXIDE: (SO_3) Toxic gas formed by further oxidation of sulfur dioxide (under certain conditions) which forms sulfuric acid (H_2SO_4) when dissolved in water. Sulfur trioxide is an undesirable byproduct when burning sulfur for sulfite cooking liquor preparation. In sulfuric acid plants, a heated catalyst is used to promote oxidation to the trioxide form.

SURGING: Sudden changes in process inputs during batch cooking to promote circulation and improve temperature uniformity. Examples of surging techniques are digester "bumping" and "burping".

T

TARGET PLATE: Surface within a blow tank where the discharging pulp/liquor/steam mixture from a batch digester first impinges.